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February 8, 1994

US EPA RECORDS CENTER REGION 5



471861

Ms. Leah Evison (HSRW-6J)
Remedial Project Manager
U.S. EPA, Region 5
77 West Jackson Blvd
Chicago, IL 60604

Dear Ms Evison:

Subject: Albion-Sheridan Township Landfill Superfund Site, Calhoun County,
Michigan

The Michigan Department of Natural Resources (MDNR) has reviewed the amended Phase I Summary Report, now called the Draft Remedial Investigation Report (RI) and has generated comments on the revised document. The general comments are listed below. General and specific comments generated by our staff geologist, Mr. Robert Delaney are attached.

Our review was based on the revised pages of the RI report that were submitted to the MDNR in response to comments submitted by the US Environmental Protection Agency (EPA) and the MDNR following the review of the first draft Phase I Summary Report, in July of 1993.

During our review of the amended pages, we noticed that, in the Introduction Section, the "Presumptive Remedy" Program that this site has been a part of since the initiation of the RI, was not specifically mentioned by name. Considering the amount of time, energy and emphasis that the EPA has invested in this program and the guidance that was developed to implement it, the MDNR feels that a more straight forward explanation of the Presumptive Remedy approach and its application to this site, needs to be made. It would also be appropriate that a more thorough description be supplied for "containment technologies", such as landfill capping, leachate collection and treatment, landfill gas control, etc. The public should have a clear understanding that the decisions reached and remedy selected are directly attributable to the Presumptive Remedy program. Since this document will ultimately be released to the public, the better the breakdown of terminology we supply, the easier it will be for the public to understand what the Presumptive Remedy approach means and how we applied it to this site.

Ms. Leah Evison

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February 8, 1994

Our review of the ARARs package, sent to us by WW Engineering and Science, is underway. I expect to have comments submitted to you on or before February 16, 1994.

If you have further questions, feel free to contact me.

Sincerely,

A handwritten signature in cursive script, appearing to read "Gene L. Hall", followed by a stylized flourish or set of initials.

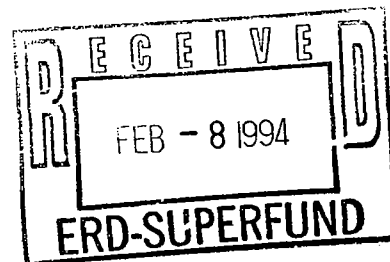
Gene L. Hall
Superfund Section
Environmental Response Division
517-373-6808

cc: Ms. Claudia Korbawy, MDNR
Mr. Bob Delaney, MDNR
Albion-Sheridan file (U1)

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

February 7, 1994



TO: Gene Hall, Project Manager
Site Management Unit 1
Superfund Section
Environmental Response Division

FROM: Robert L. Delaney, Jr., Geologist
Superfund Support Unit
Geological Services Section
Environmental Response Division

SUBJECT: Review of Draft Remedial Investigation Report,
Albion-Sheridan Township Landfill, Calhoun County

I have completed my review of the Albion-Sheridan Township Landfill draft Remedial Investigation (RI) Report. I have the following comments.

In general the report is thorough and well done. However, there are several potential errors in the overall characterization of the site. There are significant differences in the site characterization (based upon physical evidence) regarding the "interpretation" of the site hydrogeology. Static water level elevations, taken subsequent to the completion of the RI, demonstrate a groundwater flow direction that is contrary to the interpretation that is presented in the RI. Groundwater flow directions have been proven to be different than anticipated, and there are other significant inconsistencies in the site characterization presented in the RI. These inconsistencies are not inconsequential. They are substantial and therefore, warrant additional investigation because a regional fractured bedrock aquifer system, which serves industrial, domestic and municipal users, is at risk. A cooperative effort between the agencies, to resolve these significant differences, will reduce the chance of improper remedy selection and will do much to be alleviate concerns regarding the continued safety of the regional fractured bedrock aquifer.

Correspondence from this unit has documented our interpretations, and our concerns have also been presented during numerous meetings with yourself and EPA. The analyses that was done will not be reiterated. However, the reader should refer to a December 15, 1993 memo from Robert Delaney to Gene Hall, entitled, "Response to Rauland Sharp's September 3, 1993 Letter, Proposed Additional Hydrogeologic Investigation, Albion/Sheridan Township Landfill:" An August 9, 1993 memo from Robert Delaney to Gene Hall, entitled, "Recommendations for Additional Remedial Investigation, Albion/Sheridan Township Landfill:" An August 10, 1993 letter from Gene Hall to Rauland Sharp, entitled, "Michigan Department of Natural Resources Recommendations for Additional Remedial Investigation Field Work at the Albion-Sheridan Township Landfill Superfund Site:" A July 16, 1993 memo from James Heinzman to Gene Hall, entitled, "Albion Sheridan Township Landfill, Draft Phase I Summary, June 1993."

COMMENTS**Section 1.1, page 1-2, bullets 3 & 4**

The RI states that the goals of the investigative effort were to, *"Characterize the hydrogeologic and physical setting, and evaluate the most likely contaminant migration pathways and physical features that could affect potential remedial actions,"* and, *"Determine the migration rates, extent, and characteristics of any contamination that may be present at the site."* The comments I have regarding the RI are presented with these goals in mind. Unless a site is adequately characterized, any remedial decisions that are made are likely to be seriously flawed. Superfund projects have, in the past, failed to perform adequately because of improper characterization of sites. It is hoped that through the combined efforts of EPA, its contractor and MDNR, the chance of failure on this site will be reduced to the minimum. Comments included herein regarding the RI are presented with these goals in mind.

The State is especially concerned about the characterization of this site because improper site interpretation and characterization could lead to an inappropriate remedy selection. The selected remedy must be protective of public health and the environment. A regional public and industrial water supply is at risk. Data which is sufficient to guarantee that the selected remedy will not impact this ~~because~~, fractured bedrock aquifer system is required due to the site specific hydrogeological conditions. A cooperative effort between the agencies, to conclusively demonstrate that human health and the environment will be protected at this site, is imperative due to the risk associated with the potential contamination of this regional aquifer system.

Section 3.1.2, Intermediate and Deep Electromagnetic Survey (EM-34), page 3-2, second paragraph

In discussing the intermediate depth EM-34 study it was stated that, *"Quadrature-phase conductivity values range from 2 to 7 mmhos/m, with values increasing to the south. This range of values is typical for unsaturated sandy soils."* Because the survey was looking for a conductive plume in saturated sands and bedrock, this statement should be expanded upon.

Section 3.1.2, page 3-3, first paragraph

The report states that, *"Conductivities greater than about 5 mmhos/m were measured over a southwesterly trending area (shaded), as seen in this figure. This subtle trend could be associated partially with topographic effects and proximity to fill. However, water level data collected subsequent to the survey indicate that the general groundwater flow direction correlates with this trend, suggesting that the subtle anomaly could represent ground water containing elevated levels of dissolved constituents."* This same analysis was used to support the same interpretation using the deep EM data. Since the survey has been done, EPA has used these results to argue against the possibility of a plume of contamination moving to the northwest toward the Orchard Knoll subdivision (see Leah Evison's January 10, 1994 memo to Mary Pat Tyson entitled, "Response to MDNR Disputed Items Regarding Albion-Sheridan Township Landfill," discussion of locations 2 & 3.) Because there has been a reliance upon this survey to "define" the plume, I feel it is important to add more precision in the understanding of the level of uncertainty that we are dealing with in the analysis of the EM data.

First, the consultant correctly identified the problem that topographic relief creates. Assuming that the consultant is right that there is no contaminant plume in the northwest corner of the western parcel, and assuming that there is no significant specific conductance plume (as shown in figure 55 of the RI) under the flood plain along line 4850N, then topographic effects account for 6 to 8 mmhos/s difference between the highest topographic point of the survey in the northwest corner of the western parcel and the lowest point surveyed along the flood plain. Specifically, EM 34 (intermediate) readings along the river, at elevation 946, yields readings of around 7 to 10 mmhos/m (per the text). Figure A-20 would indicated that most of the readings must have been near the 9 to 10 mmhos/m reading. In the northwest corner of the survey grid, for the EM 34 (intermediate), readings were around 2 to 3 mmhos/m at approximate elevation 990 feet. Thus elevation changes of 44 feet at the site may account for about 6 to 8 mmhos/m of EM reading difference. In the area where the "southwest" trending plume is located, there is over 30 feet of topographic relief. Topographic change alone could easily account for 4 to 6 mmhos/m of variance in EM readings over the area showing the "southwesterly trending plume." The EM 34 (intermediate) readings for the western parcel only vary from a minimum 2 mmhos/m to a maximum of 7 mmhos/m, a difference of only 5 mmhos/m.

Adding to the complexity are a number of other variables. The consultant correctly identified proximity to the landfill waste as possibly having an effect on EM readings. To that could be added the effect of utility lines that likely run along the southern border of the parcel (none have been noted on the geophysics maps, but there appear to be utility poles along this edge of the surveyed area on some of the air photos of the site and there is a line of homes on the northern edge of Erie road which must be supplied with electricity.) Additionally, the perched layer at MW8 and the clay seems at MW6 and MW4 coupled with the absence of such clays at MW9 would influence EM readings. Additionally, bedrock topography and amount of fracturing could be influencing the readings.

If the specific conductance of the groundwater is influencing the EM readings, considering the effects of topography alone, its influence can only be on the scale of 1 to 2 mmhos/m. This would easily have been lost by the competing influences that I have mentioned above.

As a final caution regarding the use of the EM 34 data, it should be noted that the EM data failed to reveal the contamination that is supposedly moving to the south from MW3. MW3 showed higher levels of contamination at shallower depths than any other well on site. Thus, it should be more easily picked up by the EM instrumentation. Yet the surveys show decreasing EM readings as one moves toward MW3. Additionally, if the EM is working as well as hoped, then the EM readings taken on the eastern ends of 5500 and 5400 ("unfilled areas") would indicate a plume of groundwater contamination at this location. As there is no well in this area, it should probably have been investigated.

It should also be noted that, if the EM data interpretation is correct, then the southwestern corner of the survey shows that the plume is moving towards the homes on the north side of Erie Road. The plume can not be far from these homes and their residential supply wells. The presence of vinyl chloride in the plume at MW9 is, therefor, of serious concern.

Finally, it is not appropriate to be reliant upon the EM 34 survey results to define the plume. If it is to be used in such a manner by EPA, then the data

indicates more areas of concern that should be investigated with additional wells. Field verification of any geophysical interpretation which may indicate contamination of a regional aquifer system is necessary where a risk to public health and the environment are at stake.

Section 3.8.3 GROUND WATER FLOW CHARACTERISTICS

Section 3.8.3.1 Unconsolidated Sediments, page 3-25, first full paragraph

"The direction of ground water flow through the unconsolidated unit is illustrated in Figures 42, 43, 44, and 45. Beneath the area of the landfill the ground water flow direction is toward the North Branch of the Kalamazoo River. In the area west and southwest of the landfill the flow direction through the unconsolidated unit varies. Immediately west of the landfill the ground water flow is westward, but further west of the landfill the flow curves southward toward the river." As has already been documented previously, MDNR can not agree with this assessment. First, why is groundwater in the water table portion of the aquifer flowing to the west on the western side of the site when its discharge point, the Kalamazoo river, is directly south? Groundwater flows toward lower head which is created by discharge points. There are three options to explain this westward component of flow. They are:

1. There is lower hydraulic conductivity formations between the groundwater and the discharge point, forcing the groundwater to take a circuitous route to the discharge point.
2. There is a hydraulic barrier between the groundwater and the discharge point, again forcing the groundwater to take a circuitous route to the discharge point.
3. There is a secondary discharge point for the groundwater that is competing for the groundwater or serves as its actual discharge point.

The first possibility can not be supported by the data. MW7S which is directly south of the landfill shows the highest hydraulic conductivity of any well on site. However, MW6 (all depths) and MW9 (all depths), in the zone to which the water is supposedly flowing, show the lowest hydraulic conductivities of any wells on site. If the above conceptualization of groundwater flow is correct, the data suggests that the ground water is skirting a zone of high hydraulic conductivity and flowing into formations of low hydraulic conductivity.

The second possibility again seems to contradict the data. Static water levels of the water table wells at MW8 and MW6 consistently show higher heads than upgradient wells. Interestingly, the consultant failed to put static water level measurements for MW4SG(WB) on the map even though it is screened within only a few feet of the water table. In fact, it is closer to the water table than several of screened intervals that were used to create the water table map. Had they put this information on the maps, it would have clearly shown flow from MW6 toward MW4, a 180° flow direction reversal. The consultant has tried to explain these higher heads at MW8 and MW6 by calling them perched conditions. This is valid for MW8. The static water level is several feet above the regional groundwater level and there is a clay layer above the regional groundwater elevation. However, it should be noted that, at MW8 mounding (or at least

anomalous high heads) occurs in both the weathered bedrock and the shallow bedrock. In the weathered bedrock this mounding is quite consistent and distinct. In the shallow bedrock its impact is slight.

This mounding at MW8 can only be explained by the discharge of the perched aquifer into the regional aquifer. MW6 data clearly shows that this is in fact happening. The "perching" layer is below the regional water table elevation. The two aquifers are commingled at this point.

Thus, in order for the consultant's characterization to be correct, groundwater flow to the west of the site that "...*curves southward toward the river,*" would mean that groundwater would have to flow from lower hydraulic head to higher hydraulic head. This is not possible and the westward component of flow can not be explained by a hydraulic barrier directly to the south of the landfill. If such a hydraulic barrier exists, it exists in the area the consultant claims the water is flowing into.

Lastly, there is the possibility that there is a second discharge point for water flowing under the landfill and toward the west in the unconsolidated (glacial) deposits. It is our belief, as we have documented, that this is the case.

We base this upon several facts. First, the glacial aquifer is underlain by the fractured Marshall formation. The fracturing, as has been documented by the consultant, is not uniform across the site and hydraulic conductivity values reflect the variability of the amount of fracturing in the bedrock. Differential fracturing usually results in preferential flow paths in such bedrock environments. The hydraulic conductivity data may hint at such a preferential flow zone as the wells in the southwest corner of the site (MW6, MW8, and MW9) showed low hydraulic conductivities in the weathered bedrock and the shallow bedrock as compared to the hydraulic conductivity values found at MW3, MW4, MW5 and MW7. There is an insufficient number of wells to see if this is a consistent trend.

Additionally, groundwater gradients flatten out dramatically to the southwest of the landfill in the shallow bedrock and weathered bedrock aquifers. The consultant believes that this is a transition zone between a recharge zone and a discharge zone. It is our belief that it is more likely a recharge zone to bedrock. Flat head level zones are usually associated with recharge zones. Head levels, also, often flatten out as the hydraulic conductivities of a formation increase. This would be consistent with the potential trend in the hydraulic conductivity data that I mentioned above.

Lastly, the static water levels in the Orchard Knoll study area in the shallow bedrock aquifer are some of the lowest associated with the site. The only static water levels that are comparable that are associated with the site, are the water levels found next to the river itself. The bedrock aquifer in the Orchard Knoll subdivision area is being heavily influence by some discharge point other than the river.

The strong deflection of groundwater flow toward the west in the glacial, weathered bedrock and shallow bedrock would seem to be more easily explained by, a highly permeable fractured bedrock zone to the west and northwest of the site that is being influenced by the same discharge point that is drawing on the Orchard Knoll shallow bedrock. This interpretation matches the physical evidence

with respect to static water elevations collected on site. Due to the site specific hydrogeology, this interpretation is more likely than the circuitous flow path to the North Branch of the Kalamazoo River. The site specific groundwater flow data indicates that, there is a groundwater divide which is being influenced by two separate discharge points.

It must be stated, however, that this is not just an interesting intellectual exercise. We believe that the Jackson District staffs' conclusions, contained in, "Investigation Report, Preliminary Groundwater Assessment for Orchard Knoll, March 1993" (previously transmitted to EPA), that the historical contamination found at the Orchard Knoll subdivision may have come from the Albion-Sheridan Landfill. If so, it is important for the sake of the success of the characterization and remediation of the site, that this be determined to be either correct or false. The historical levels of contamination found at Orchard Knoll were very high, and if they originated at the landfill, it would likely have serious implications for the project.

Section 4.1.3.2, Inorganic Analyte Analyses, page 4-9

The consultant discusses the risks posed by the site. For instance it is stated that, *"Therefore, these compounds do not pose a significant direct human contact risk when the site is evaluated as a whole."* Is this an appropriate discussion for this document? Is this document, under the presumptive remedy guidance, to serve as the risk assessment? If so, our toxicologist should also review the document. If a separate risk assessment is being prepared, then these types of statements should likely be removed. Otherwise the document may not be perceived as an objective analysis of contaminant extent.

cc: Jim Heinzman, ERD

Robert Delaney Jr.